TYPE **1**
SCENARIO

Violates
realistic
time
frames

THE WAR ON CLIMATE CHANGE

AS CLIMATE DISASTERS GROW BIGGER, STRONGER, AND MORE FREQUENCY, the world mobilizes for a war against natural forces that threaten cities, industries, and individuals. This is war on the scale of the World Wars of the 20th century, and it costs not only money but also energy. Just as urban budgets are diverted from quality-of-life services in this time of war, energy production worldwide has been diverted to build strongholds against floods, to move water over vast distances to drought-stricken zones, and to rebuild communities that haven't been able to protect themselves from the ravages of weather. At the same time, production of energy sees a sharp initial decline, as the dirtiest of the fossil fuel–based power plants are taken offline. To the surprise of some, large-scale efforts to stanch the increase in global temperatures—geoengineering—also diminish the world's capacity to produce solar energy, as the scattering of light from high-atmosphere particles greatly reduces the efficiency of many kinds of solar technologies. The result? Householders, small industries, and communities everywhere depend on locally generated power from diverse sources and the smart protocols that link distributed production to the grid to avoid energy rationing and secure more or less reliable power for their familiar lifestyles.

- Development efforts around the world slow as energy flows into the collective task of mitigating and remediating climate impacts—inhibiting the recent growth of numerous so-called leapfrog economies. They never get a chance to leap.

- Because distributed energy production depends on access to a wide range of new consumer products—including piezoelectric wearables, wirelessly charged batteries, and smart connection devices—those at the low end of the income scale find themselves in a growing energy divide. In urban and rural areas alike, energy access is a key measure of inequality.

- Build-out of the distributed energy grid, including the smart grid, is uneven, even in those countries where a strong central energy infrastructure has existed. The result is the growth of energy deserts, where people have been unable to self-organize to produce high-performance energy.

- Because the centralized grid is the main battlefield in the war on climate change— and because it's not as resilient as the distributed grid—it often fails. When it does, cascading energy deficits sweep back into the decentralized grid. Some communities therefore begin to disconnect entirely from the big grid to become locally self-sufficient.

- On top of the wholesale elimination of the least efficient power plants, fossil fuel energy use in general is seriously curtailed as large carbon taxes make both production and consumption less profitable. Permits for alternative energy installations get fast-tracked to expand the energy footprint without adding to carbon footprint.

THE WAR ON CLIMATE CHANGE

- **Climate disasters** accelerate faster than expected.
- **Geoengineering solutions** are adopted sooner than expected.
- **Innovation in alternative energy technologies,** as well as the threat of energy rationing, accelerates the development of the distributed grid.
- **Smart-grid protocols** are fast-tracked as national security technologies.
- **Frequent climate disasters** drive faster development of battery back-up technology.

LINKS TO FORECASTS:

▌ **DEINDUSTRIALIZATION** is accelerated by the push to eliminate carbon emissions and to build a more resilient, distributed energy grid.

▌ **DEMATERIALIZATION** becomes a key tool in the climate fight, as the cost of physical manufacturing and transportation of goods skyrockets.

▌ **SOCIAL PRODUCTION** binds lower-income/low-energy communities together for small-scale, distributed, collaborative production.

SIGNALS

### 2011 sets record for high temperatures and weather-related disasters

According to the U.S. National Weather Service, 2011 set a record for the number of weather-related disasters costing one billion dollars or more. More than 20 U.S. cities hit temperatures never before recorded, and much of Texas had its hottest summer ever. Globally, 2011 was the hottest La Niña year on record, and tenth hottest overall.

HOTTEST SUMMER ON RECORD — JUN-AUG 2011

weather.com

### Two degrees of warming is no longer a "safe" threshold

For the last decade, scientists have considered that two degrees of warming is the threshold for dangerous climate change, and this threshold value was codified as recently as the Copenhagen Accord in 2009. However, even this amount of warming may bring catastrophic results across a spectrum of risks, according to Kevin Anderson, who is the former director of the UK's top climate research lab, the Tyndall Energy Program.

Risk Level by Degrees of Warming
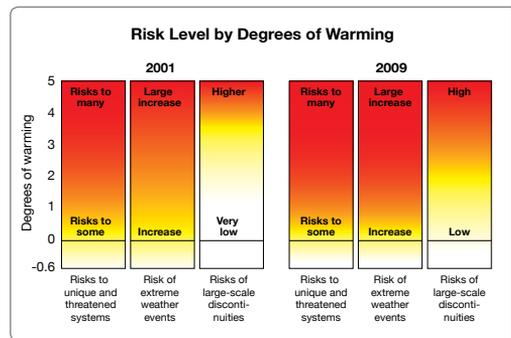
grist.org

Avoiding two degrees of warming requires unprecedented cuts to carbon emissions

Anderson also shows that emissions must peak no later than 2015 to allow a plausible decline in emissions. If emissions instead peak in 2025, they would have to be cut by more than two-thirds within a year in order to avoid devastating warming, which is implausible. (Note that the graph represents the IPCC consensus scenario, which is probably optimistic.)

Total Greenhouse Gas Emission Pathways (G+CO$_2$e)
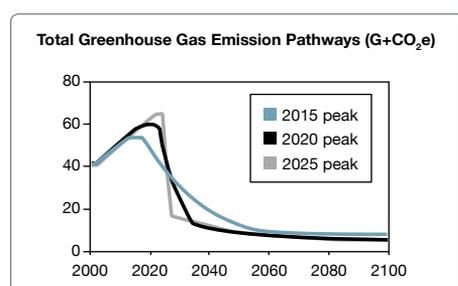
grist.org

ONCE IN A RED MOON

AT FIRST, HEADLINE WRITERS AROUND THE WORLD HAVE A FIELD DAY— "RED MOON RISING," "THE MOON IS RED," AND THE LIKE. The spectacle of the Chinese landing men on the Moon captivates the world, leading to rushed press conferences in Washington and parades in Beijing. But the Taikonauts immediately begin to assemble buildings on the lunar surface, and China starts referring to the mission not as a "landing," but as a "colony." Within two weeks, China launches a series of unmanned landers with supplies, and within three months, they send another set of colonists. By the end of 2022, China spells out its plans for the colony, named 新家 or *Xin Jia*, which translates roughly to "New Home." Those plans include research into large-scale, off-Earth habitation; mining of minerals, ice, and (especially) helium-3 (3He), an isotope ideally suited for nuclear fusion power; and a base for longer-range exploration and colonization of the rest of the solar system, including Mars. Most importantly, China asserts that *Xin Jia* and its vast surrounding areas are now Chinese territory. Simultaneously, China announces that it is pulling out of the 1967 Space Treaty, which bars claims to ownership of places off the Earth. American, European, and Russian leaders make strongly worded speeches and threaten various sanctions, but it soon becomes clear that China, for all intents and purposes, now owns the Moon.

- Most global observers see China's Moon landing as a sharp rebuke of the United States, but some (mostly U.S.) commentators see it as a sign of China's immaturity as a world power—it's just going through the same phase the United States went through 50 years earlier.

- Officially, the New Home region is to be entirely owned and operated by China; unofficially, Beijing has made it clear that it will be willing to lease parts of the region to non-Chinese customers, particularly industries.

- Although much of the public controversy revolves around China's claims to ownership, U.S. officials are much more concerned about the strategic implications: with New Home permanently facing Earth, the same technologies allowing the propulsion of ores off the lunar surface could launch devastating artificial asteroids even more destructive than nuclear weapons.

- Observers hoping that the United States would react to New Home the way it did to Sputnik are disappointed, as the situation very quickly devolves into finger-pointing partisanship and more debates over government spending.

- In China, internal debates over the cost and utility of New Home are quickly submerged by a wave of national pride and excitement over the landing and the New Home agenda.

- A coalition of commercial space launch service providers, which is developing increasingly powerful launch platforms for NASA and the European Space Agency (ESA), announces a project to build a launch system able to escape Earth's gravity, with a goal of landing humans on Mars by 2030.

ONCE IN A RED MOON

- **China advances** from modified 1970s Soviet spacecraft designs to entirely new lunar-capable designs in less than a decade.
- **China moves** from orbital launch to large-scale lunar colonization in a decade.
- **Supply missions** run frequently enough to support a colony.
- **Nuclear fusion** is advanced to create a market for 3He.
- **Environmental and demographic problems** in China happen too slowly to interrupt lunar plans.

LINKS TO FORECASTS:

▌ **HYPER-URBANIZATION** drives China to look to space for its long-range plans to deal with population growth and post-industrial development.

▌ **DEMATERIALIZATION** allows for rapid construction on the Moon, using sophisticated distributed fabrication, robotics, and network technologies.

▌ **INFORMATION INTENSIFICATION** enables cost-effective colony building, mining, and transportation to and from the Moon, boosting process efficiency.

SIGNALS

China expands its space agenda

On November 3, 2011, the Chinese spacecraft Shenzou 8 docked with its new space lab Tiangong 1 in Earth orbit, a key stepping-stone to more distant exploration. In December, China released a white paper listing space plans through 2016, including robotic lunar landers.

space.com

Proposed solar sail–based probe to deflect asteroid

Chinese university researchers are staking out ambitious plans for space missions, including a proposal to use a solar sail–based probe to orbit and deflect the near-Earth asteroid Apophis. The asteroid is projected to make an extremely close approach to Earth in 2029 (indicated by the red bar in the diagram).
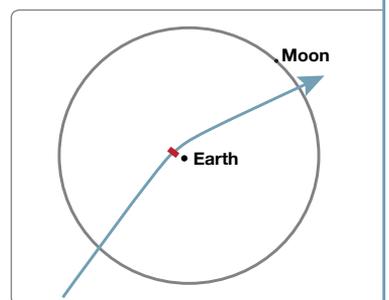

neo.jpl.nasa.gov

Non-radioactive 3He explored

Current nuclear fusion projects rely on highly radioactive hydrogen isotopes as fusion precursors, but researchers are exploring the potential for non-radioactive helium isotopes to serve as an alternative. The lunar surface, because it isn't shielded from the Sun's particles by a magnetic field, is extremely dense with 3He, and researchers have long considered it a possible "fuel depot" for space exploration.

Vision of Lunar Helium as "Bridge Between Worlds"
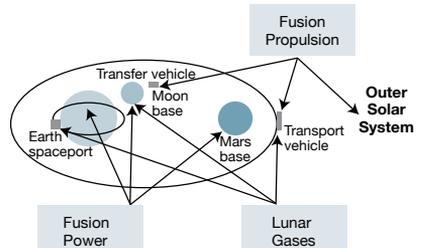
nss.org

THE FABRICATION COMMONS—ENCLOSED!

THE RAPID ADOPTION OF BOTH PERSONAL AND COMMERCIAL 3D PRINTING AND FABRICATION TOOLS CATCHES MOST MANUFACTURERS AND DISTRIBUTORS BY SURPRISE, and the transformations once seen in media and content are now being felt for consumer products and durable goods. The innovations take legislators and regulatory bodies by surprise as well, as evidenced by the spate of legislation written by panicked lobbyists. These new laws create stiff financial penalties and even jail sentences for "pirate printer" groups. Well-established groups such as Shapeways and Thingaverse are sent shut-down notices—and although a massive backlash driven by the "free culture" movement encourages many to stand up to the scare tactics—free and open 3D printing is pushed underground. Secret negotiations are undertaken to extend WIPO and WTO rules, requiring tracking and toll-collecting technologies in every commercial fabrication device, with the option of forcing users to pay product designers for every use. Well-known computer makers promise a new platform that will streamline search, access, and payment systems for 3D printing data files and materials. While many lament the loss of freedom that the enclosure of "open fab" has engendered, others are busy creating user-friendly, low-cost, and efficient alternatives that lie somewhere between total control and total freedom.

- Activists continue to push for open manufacturing while hackers easily defeat control technologies and release design files to underground sharing sites.

- In the more experimental schools, 3D design becomes part of grade school curriculum. Computer-assisted design companies create a series of child-friendly design software tools, but kids turn out to be more proficient with complex AutoCAD and design software than many adults.

- 3D printer spam and the hacking of networked fabricators is a growing problem, with viruses and automatic programs, or *bots*, hijacking home 3D printers to produce physical advertisements, either added to user-requested products or printed out on their own—many of which are less than family-friendly.

- Old industrial business practices struggle to transition to an open-fab world. Lobbyist-written intellectual property laws are forced through the U.S. Congress and the European Parliament, and make their way into international treaties in an effort to stem the tide of rampant infringement of design patents and copyright.

- Despite the media focus on piracy and spam, some observers expect the new enclosed fabrication model to become a designers' paradise, as new apps and tools liberate designers from many of the constraints that used to keep their products from the market.

THE FABRICATION COMMONS— ENCLOSED!

- **The rise of powerful, inexpensive 3D printing** occurs much faster than anticipated.
- **Electroactive (mobile) and electronic (computational) polymers** move from laboratories to 3D printer "toner cartridges" quickly.
- **Manufacturing and distribution economies** shift rapidly to accommodate these new technologies.
- **Public adoption of and innovative uses for 3D printing** grow swiftly, as new applications and consumer products flood the market.
- **Product designers and manufacturers** ignore the talk of "Napster fabbing" and wait until 3D printing technology proliferates before pushing for restrictive legislation.

LINKS TO FORECASTS:

▌ **HYPER-URBANIZATION** is slowed through the proliferation of distributed fabrication technology and community adoption of open fab technologies.

▌ **DEMATERIALIZATION** takes hold as the more advanced forms of 3D printing undermine traditional industrial, trade, and labor models.

▌ **SOCIAL PRODUCTION** drives the spread of advanced 3D printing, creating a critical mass of consumers with home fabbing equipment.

▌ **INFORMATION INTENSIFICATION** provides the infrastructure for moving more and more of the lifecycle of products into the digital space—and the rationale for imposing IP limits on fabbing.

SIGNALS

Users customize and print Internet-enabled toys

London-based MakieLab is a startup building Internet-enabled, 3D-printed toys that can interact with mobile apps and online games, each one user-customized before printing. The company fabs the toys from users' designs and delivers them to the customers' doorstep.

makielab.com

makielab.com

Article explores 3D printing as "the next Napster"

For many observers, the 3D printing era is likened to the early days of peer-to-peer music file sharing on the Internet. A recent article in *Ars Technica* notes that, despite significant logistical and legal differences between content sharing and printing of physical goods, many of the same legal and economic arguments apply, and these analogies are likely to follow alongside most discussions of 3D printing and IP ownership.

"The next Napster? Copyright questions as 3D printing comes of age," by Peter Hanna. arstechnica.com

3D/DC event seeks to inform policymakers

Produced by the nonprofit Public Knowledge, which promotes open access, *It Will Be Awesome If They Don't Screw It Up* is a guide to 3D printing, published in association with the 3D/DC event held in April 2011 at the Rayburn House Office Building at the Capitol. Its goal was to introduce 3D printing and associated ideas to policymakers.

publicknowledge.org

THE CONNECTED POLICE STATE

AS MODERN DEMOCRATIC STATES REACT TO INCREASINGLY COMPLEX AND DANGEROUS PRESSURES, including the threat of terrorism, they experience an irresistible transformation into repressive structures. This tilt toward a police state transcends traditional cleavages such as Democrat/Republican. At the same time, the rapid development of technology makes it possible to create tools that dictators like Stalin or Hitler could only have dreamed of. It's now possible to capture the movements, the data, the behavior and even the thoughts of hundreds of millions of citizens without violating the basic tenets of democracy, the laws against improper search and seizure, or privacy as it has been redefined in an always-on, connected world. The result of these two trends is a form of population control that still adheres to the outward trappings of democracy—with elections, public protest, and so-called due process—but places citizens in a state of permanent, sophisticated surveillance. As new threats continue to emerge, it becomes logical to test small children for potential deviance, analyze online transcripts for early signs of challenges to authority, and block individual initiatives that do not match the dominant ideology at a given time. In such a state, bureaucracy becomes invisible, ceding enormous power to the rules and regulations embedded into everyday systems: the authoritarian state meets the Total Information Awareness Network.

- Power has shifted from elected representatives of the people to a highly creative, almost occult technological fraternity that has no other rule than its own enrichment.

- The technological power elite appears to follow the lead of elected officials in censoring content and setting behavioral standards, but in effect, designs and executes protocols to its own advantage.

- As an unintended consequence of the high-security infrastructure, the only way for creativity to thrive and for the economy to move forward with novel business practices is widespread corruption—whether it is circumventing contradictions in regulations by paying for "technological loopholes," or buying information that enables direct hacking of systems.

- Organized crime is redefined as a sophisticated coevolving structure that becomes a key factor in the growth and health of the economy—as in the Soviet Union of the 1970s and 1980s, when criminal networks helped destroy communism and ultimately emerged as the only organizations capable of rebuilding Russian industry and moving it forward.

- Political protest, while weak, continues in the form of denial-of-service attacks, alternative parallel Internets, and highly sophisticated social bots engineered to disrupt the orderly functioning of commerce and automate counter-information campaigns.

THE CONNECTED POLICE STATE

- **Rapid spread of global unrest** drives even traditionally democratic states to implement strong state controls of political expression.

- **Both governments and private companies** make very rapid strides in data tracking and visualization tools as well as social architecting tools, such as social bots.

- **Organized crime** presses its rapidly growing advantage in a world of weak governments and weak economies.

- **Alternate Internet technologies** expand rapidly, initially driven by democratic states seeking ways to rebuild feral or war-torn states.

LINKS TO FORECASTS:

▌ **DEMATERIALIZATION** draws an ever-growing proportion of human activities online, making daily life vulnerable to surveillance and censorship.

▌ **SOCIAL PRODUCTION** creates economic demands for people to participate in the surveillance infrastructure.

▌ **INFORMATION INTENSIFICATION** filters rapidly growing stores of information to make it hard for the average citizen to see the extent of controls.

SIGNALS

Former U.S. Senator endorses Chinese-style Google censorship

Former Senator Chris Dodd, who now serves as CEO of the Motion Picture Association of America (MPAA), once advised Google to stand up against Chinese demands to block sites the government considered offensive. Now Dodd is arguing the opposite, saying "When the Chinese told Google that they had to block sites or they couldn't do [business] in their country, they managed to figure out how to block sites." The MPAA has a website devoted to "Rogue Websites" and has promoted controversial anti-piracy legislation.

mpaa.org

Silicon Valley conference explores human rights issues in technology

In October 2011, several Silicon Valley companies—including Google, Yahoo!, Mozilla, and Facebook—sponsored a conference to "discuss how the high-tech sector can better manage the human rights implications of new technologies." Among the topics covered in workshops were how (or whether) to regulate the Internet; the role technology companies play in enabling, supporting or limiting civil society, free speech, and human freedom; and how companies should embed human rights during the development of new technologies rather than responding to crises when they occur.

rightscon.org

United States funds "Internet in a suitcase"

In support of dissidents around the world, the U.S. State Department is investing millions of dollars to create shadow networks—both Internet and mobile phone networks—around the world. One initiative is the so-called "Internet in a suitcase," which uses off-the-shelf components to create a mobile Internet connection with a link to a wide area network, bypassing telecommunications companies that may be called upon to censor sites or shutdown access to block dissidents.

AFP.com